INTERIOR WALLBOARD AND METHOD OF MAKING SAME

FIELD OF THE INVENTION

This invention relates to an improved gypsum wallboard faced on both major surfaces with glass fiber mats. More particularly, the present invention relates to a gypsum wallboard suitable for internal use covered on one major surface with a coated glass mat of a first basis weight made from glass fibers of a specified diameter and length such that the mat has a surface suitable for Level 4 finishing (GA-214-96) and covered on its other major surface with an optionally coated glass fiber mat having a second, generally higher basis weight and made from glass fibers of a larger diameter and of a longer length than the fibers of the coated glass mat, such that the board has acceptable flexural strength properties.

BACKGROUND OF THE INVENTION

The building industry widely uses gypsum wallboard, consisting of a core of set gypsum sandwiched between two sheets of multi-ply paper facing material in the construction of residential homes, commercial buildings, and other structures. The use of paper-faced gypsum wallboard has become one of the most common means of finishing the interior structure of buildings. Paper-faced gypsum wallboard, also known as sheetrock or drywall is usually manufactured (precut) in flat sheets of 4 ft. by 8 ft., or 4 ft. by 12 ft., typically having a thickness of ½" or ⅝". The sheets of the paper-faced gypsum wallboard are hung on wood or metal studs to form the interior partitions or walls of rooms, elevator shafts, stairwells, ceilings and the like.

Conventional paper-faced gypsum wallboard is typically manufactured from a slurry of stucco (calcined gypsum slurry, gypsum hemi-hydrate slurry) wherein the slurry is placed between two layers of multi-ply paper facers and the slurry is allowed to set. In typical paper-faced gypsum wallboard, the two layers of multi-ply paper facers contain/restrain the slurry while it sets and provide the flexural strength required in installation and use. The set gypsum is a hard and rigid product obtained when the calcined gypsum reacts with water to form calcium sulfate dihydrate.

During wallboard production, water in excess of that needed to hydrate the calcined gypsum must be removed from the slurry during the curing. While a certain amount of water is required to hydrate the calcined gypsum, excess water is added, e.g., on the order of two, or more times than that actually needed to hydrate the calcined gypsum, in order to obtain a smooth, free-flowing slurry suitable for transporting and then depositing on the lower facing sheet to form the board core. This excess water must be evaporated primarily through the facing sheets as the board is cured and dried.

Gypsum wallboard is typically made as a continuous product on an endless conveyor using rolls of the paper facing material. The board is cut into discrete lengths to accommodate subsequent handling and then dried in heated dryers until the discrete boards are completely dry. The quality of the paper facers determines the kind of applications suitable for using the boards and the surface treatments that may be used on the boards.

The paper facers usually employed in the production of paper-faced gypsum wallboards generally consist of two types. The facer used on the side of the wallboard intended to face the interior of a room is of a multi-ply construction with the outer plies usually composed of a better grade of paper. This allows the smooth surface board to be finished in a variety of aesthetically acceptable ways, especially by painting. The inner plies, including the one that contacts with the board core is usually made of repulped newsprint and recycled corrugated boxes. The paper facer used on the backside of the board destined for placement against the studs is usually made of a plurality of plies of the lower grade of paper, e.g., the repulped newsprint and corrugated boxes.

Multi-ply paper facings have long been used because they provide a unique combination of properties. Paper is able to form a satisfactory bond with the set gypsum, particularly gypsum with added binder, e.g., starch, so that the facing is not easily delaminated from the set gypsum core. As noted above, water that is added to prepare the gypsum slurry and that does not chemically combine with the stucco (calcined gypsum) must evaporate mainly through any facing sheets without causing delamination. Paper is sufficiently porous to allow the water vapor to permeate through it during gypsum wallboard manufacture. Paper also presents a smooth surface that can easily be finished in a number of ways, such as by application of wallpaper or especially by painting, with minimal surface preparation.

Although paper is a relatively inexpensive facing material and is easily used in the process of manufacturing wallboard, it has disadvantages, particularly with regard to moisture-resistance. Moisture can have deleterious effects upon paper-faced wallboard. In addition to degrading strength and other structural properties, moisture (in combination with other factors) can encourage the growth of fungi (including, e.g., mold). The problem can (under certain circumstances) be particularly acute with regard to certain spaces that, upon installation of the wallboard, are enclosed and inaccessible.

As an alternative to paper facing, gypsum wallboard can also be manufactured with a fibrous mat (such as a mat of glass fibers) as a facing material.

Examples of such wallboards include those described in, e.g., U.S. Pat. No. 3,993,822, U.S. Pat. No. 5,644,880, U.S. Pat. No. 5,791,109, U.S. Pat. No. 5,883,024 and U.S. Pat. No. 6,001,496. In addition to improved water resistance, fibrous matting, and especially glass fiber matting may provide significant improvements in strength and other desired structural attributes.

U.S. patent application Ser. No. 10/957,745 (incorporated herein by reference) describes a recent advancement in gypsum wallboard technology for interior applications. According to this patent application, at least one major surface of the gypsum wallboard is faced with a unique, coated non-woven glass mat suitable for producing, in the resulting glass mat-faced gypsum board, a surface suitable for Level 4 finishing in the same manner as commercially available multi-ply paper-faced gypsum wallboard, i.e., a very smooth surface.

This result is achieved by using, as a facer material for making gypsum wallboard, a coated non-woven, glass fiber mat which comprises, and which preferably consists essentially of, fibers having a diameter of no greater than about 11 microns, and preferably no less than about 8 microns and having a length between ¼ and ¾ inch, that are bound together predominantly with an acrylic binder having a suitable softness. The coating on the glass mat is prepared by drying an aqueous mixture of (i) a mineral pigment, (ii) a polymer adhesive binder (also preferably an acrylic binder) and optionally (iii) an inorganic adhesive binder. Preferably, the coating is applied to the glass mat before the glass mat is used to make the gypsum wallboard. Such mat is referred to as pre-coated mat.

During the initial development of this product, the actual coated glass mat facer material used on the interior (smooth) face was made using a blend of 75% by weight ¼ inch long